

salmon cried about the streets of London, and that was generally pickled. My son, or at any rate my grandson, whenever he goes to buy fish, may be offered his choice between a fresh salmon from Ontario and another from Tasmania. The fishing industry being thus important and thus ancient, it is singular that it can hardly be said to have kept pace with the rapid improvement of almost every other branch of industrial occupation in modern times. If we contrast the progress of fishery with that of agriculture, for example, the comparison is not favourable to fishery. Within the last quarter of a century, or somewhat more, agriculture has been completely revolutionised, partly by scientific investigations into the conditions under which domestic animals and cultivated plants thrive, and partly by the application of mechanical contrivances and of steam as a motive power to agricultural processes. The same causes have produced such changes as have taken place in fishery, but progress has been much slower. It is now somewhat more than twenty years since I was first called upon to interest myself especially in the sea fisheries. And my astonishment was great when I discovered that the practical fisherman, as a rule, knew nothing whatever about fish, except the way to catch them. In answer to questions relating to the habits, the food, and the mode of propagation of fish—points, be it observed, of fundamental importance in any attempt to regulate fishing rationally—I usually met with vague and often absurd guesses in the place of positive knowledge. The Royal Commission, of which I was a member in 1864 and 1865, was issued chiefly on account of the allegation by the line fishermen that the trawlers destroy the spawn of the white fish—cod, haddock, whiting, and the like. But, in point of fact, the spawn which was produced in support of this allegation consisted of all sorts of soft marine organisms except fish. And if the men of practice had then known what the men of science have since discovered, that the eggs of cod, haddock, and plaice float at the top of the sea, they would have spared themselves and their fellow-fishermen, the trawlers, a great deal of unnecessary trouble and irritation. Thanks to the labours of Sars in the Scandinavian seas, of the German Fishery Commission in the Baltic and North Seas, and of the United States Fishery Commission in American waters, we now possess a great deal of accurate information about several of the most important of the food fishes, and the foundations of a scientific knowledge of the fisheries have been laid. But we are still very far behind scientific agriculture, and, as to the application of machinery and of steam to fishery operations, in this country at any rate, a commencement has been made, but hardly more. The relative backwardness of the fishing industry made a great impression on my colleagues and myself in the course of the inquiries of the Royal Commission to which I have referred; and I beg permission to quote some remarks on this subject which are to be found in our Report issued in 1866:—"When we consider the amount of care which has been bestowed on the improvement of agriculture, the national societies which are established for promoting it, and the scientific knowledge and engineering skill which have been enlisted in its aid, it seems strange that the sea fisheries have hitherto attracted so little of the public attention. There are few means of enterprise that present better chances of profit than our sea fisheries, and no object of greater utility could be named than the development of enterprise, skill, and mechanical ingenuity which might be elicited by the periodical exhibitions and publications of an influential society specially devoted to the British fisheries." Taking this Exhibition, the third of its kind, as evidence that the public attention to fisheries for which they hoped had been attained, he remarked that the conference opened that day formed an entirely new feature of such exhibitions, and expressed a hope that there was in them a germ of that which, by due process of evolution, might become a great society, having for its object the welfare and the development of the fisheries of these islands. He presently turned to the question whether fisheries are exhaustible; and, if so, whether anything can be done to prevent their exhaustion. He did not think it possible to give a categorical answer. There were fisheries and fisheries; but he had no doubt that there were some fisheries which were exhaustible. Instancing the salmon rivers, he said it was quite clear that those who would protect the fish must address themselves to man, who was reachable by force of law; and that it not only might be possible, but it was actually practicable, to so regulate the action of man with regard to a salmon river that no such process of extirpation should take place. But if we turned to the great sea fisheries, such as cod and herring fisheries, the case was entirely altered. Those who have watched

the fisheries off the Lofoden Isles on the coast of Norway, say that the coming in of the cod in January and February is one of the most wonderful sights in the world; that the cod form what is called a "cod mountain," which may occupy a vertical height of from 20 to 30 fathoms—that is to say, 120 to 130 feet, in the sea; and that the shoals of enormous extent keep on coming in in great numbers from the westward and southward for a period of something like two months. The number of these fish is so prodigious that Prof. Sars, the most admirable authority, from whom I quote these details, tells us that when the fishermen let down their loaded lines, they feel the weight knocking against the bodies of the codfish for a long time before it gets to the bottom. I have made a computation, with the details of which I will not trouble you, which leads to this result, that if you allow the fish each of them four feet in length, and let them be a yard apart, there will be in a square mile of such shoals something like 120 million fish. I believe I am greatly understating the actual number, for I believe the fish lie much closer; but I would beg your attention to the bearing of this underestimate, because I do not know that the Lofoden fishery has ever yielded more than 30 million fish in a good season; and so far as I am aware the whole of the Norwegian fisheries, great as they are, do not yield more than 70 millions. So you will observe that one of these multitudinous shoals would be sufficient to supply all the fisheries of Norway completely, and to leave a large balance behind. And that is not all. These facts about the cod apply also to the herring; for not only Prof. Sars, but all observers who are familiar with the life of the cod when it has attained a considerable size, tell us that the main food of the cod is the herring, so that these 120 million of cod in the square mile have to be fed with herring, and it is easy to see, if you allow them only one herring a day, that the quantity of herring which they will want in the course of a week will be something like 840 million. Now I believe the whole Norwegian herring fishery has never reached the figure of 400 million fish—that is to say, one half the fish which this great shoal of codfish eats in a week would supply the whole of the Norwegian fisheries. On these and other grounds it seemed to him that this class of fisheries—cod, herring, pilchard, mackerel, &c.—might be regarded as inexhaustible. But he should not venture to say this of the whole of the sea fisheries—of the oyster fisheries, for example. Here, again, the operations of man become exceedingly important. Regarding the regulation as to close time for oysters as alone absolutely futile for the purpose of protection, he urged that the more logical provisions of government supervision in Denmark, France, and elsewhere, were impracticable of application beyond the three-mile limit of this country. It was under this conviction that the Commission to which he referred recommended the abolition of all restrictive measures. In conclusion, he pointed out how heavily this question bore on the social condition of the fisherman. Every act of legislation with regard to the fisherman created a new offence. If the common welfare and the common interest, said Prof. Huxley, can be clearly shown to render such regulations desirable or necessary, then of course fishermen must put up with this as they put up with anything else—as we all put up with such restrictions. But supposing that no good case is made out, supposing that regulations of this kind are made on insufficient inquiry and based on insufficient understanding of the circumstances of the case, then I am free to confess that I think those who make such laws deserve very much severer penalties than those who break them.

THE SCIENTIFIC WORK OF THE "VEGA"¹

THE volume we have before us—the first of a series—contains the results of the scientific observations made during the cruise of the *Vega*, and to say this is obviously to indicate that it contains a rich supply of most valuable information as to that part of the Arctic Ocean which extends along the coasts of Siberia, which appears in the shape of a series of elaborate papers on different departments of natural history of the Arctic regions. Several parts of this volume are already known. Such are the "Reports to Dr. Oscar Dickson" written by Baron Nordenskjöld during the expedition, and read throughout the civilised

¹ "Vega-Expeditionens Vetenskapliga Iakttagelser, bearbetade af deltagare i resan och andra forskare, utgifna af A. E. Nordenkjöld." Vol. i. Part 1. (Stockholm, 1882.)

world as soon as they reached Europe; or his paper on the possibility of navigation in the Siberian Arctic Sea; or, again, his paper on auroræ (recently summarised in the pages of NATURE). The well-known "Reports" appear as they were written on board the *Vega*, but with a map "of the northern coast of the old continent, from Norway to Bering Strait," and with several maps of separate islands and bays. The other papers are quite new, and we find in this volume a medical report, by E. Almquist, on the health of the crew; a paper by A. Lindhagen, on the determinations of latitudes and longitudes, which will put an end to the discussions as to the accuracy of the changes made in the map of the northern coast of Siberia by the astronomers of the *Vega*; a paper by H. H. Hildebrandson (in French), on the meteorological work of the expedition, being a comparison of the climate of Pitlekaj (the *Vega's* wintering station) with the climate of other Arctic stations; several papers on the Chukches; an elaborate paper by A. Stuxberg, on the invertebrate fauna of the Siberian Arctic Sea; and a series of papers by F. R. Kjellman, A. N. Lundström, and E. Almquist, on the vegetation of the region visited.

It is known that the expedition of the *Vega* was—as is, however, always the case with so experienced a traveller as Nordenskjöld, and as it was with Parry—one of the most successful Arctic expeditions with regard to the health of the crew. No death was to be regretted, and all the thirty men of the crew reached Naples in the best condition. It is true that at Pitlekaj the sun did not disappear for months under the horizon, and that the crew were not worn out by long sledge journeys. But still the climatic conditions were not at all favourable, on account of the variability of the weather and strong winds which blew with a twenty miles' speed even during frosts—30° strong. The precautions taken for maintaining a temperature as equal as possible in the cabins and for eliminating moisture, as well as for much exercise in the fresh air and the maintenance of cheerfulness among the crew, are not to be underrated. A daily distribution of lime-juice and of jam surely had also their importance as preservatives against scurvy, and this the more as the crew of the *Vega* had no opportunities of having supplies of fresh meat during the winter. The daily baking of fresh bread was a very good innovation; as to the preserved meat, the crew very soon had enough of it, and even salted meat was preferred to corned beef; only the finer and more expensive preserved soups and steaks were appreciated throughout the cruise.

The Chukches were of course the subject of anthropological and ethnographical studies, as far as possible. Mr. Nordquist publishes a most valuable Chukch dictionary, and Mr. Almquist communicates interesting observations on colour-blindness among the Chukches, two hundred men and a hundred women having been submitted to experiments in accordance with Prof. Holmgren's hints as to this kind of research with people whose language is unknown ("Om färgblindheten," &c., Upsala, 1877). The supposition of Helmholtz and Young as to the blindness of the lower races with regard to violet rays has not been confirmed as far as the Chukches are concerned; they certainly distinguish it, but they merely call it red. The same is true with regard to pale green and bright blue; they confound both, but the organs for green are not missing with them. Like other lower races, they use much red colour for their skins, yellow being comparatively rarely used for ornaments. It results also from M. Kjellman's paper on the culinary plants of the Chukches, that, contrary to Wrangel's assertion, they do not despise vegetable food. Their provisions of plants for the winter are as large as their provisions of meat and fat. This feature so much distinguishes them from all other inhabitants of the Arctic regions that one is inclined to admit that the time is not far removed from that when they cultivated some better situated plots of soil on the

coast of the Arctic Ocean, or were compelled to leave lower latitudes which had a happier climate than that of the north-eastern extremity of Siberia. Their provisions in vegetables are a very strange mixture of various plants, among which the following are the most common:—*Cineraria palustris*, L., *Petasites frigida*, Fr., *Pedicularis sudetica*, and *P. lanata*, Willd., *Rhodiola rosea*, L., *Claytonia acutifolia*, Willd., *Halianthus peplodes*, Fr., *Polygonum polymorphum*, L., and *Salix boganidensis*, Trautvetter.

The most important papers in this volume are those devoted to the vegetation of the region visited, that is, to the lichens and mosses of the coast, to the algæ of the Siberian Sea, and to the phanerogamic flora of Novaya Zemlya, of the coast region, and of the Asiatic coast of Bering Strait. The lichens are comparatively rare on the coast; whole stretches are quite devoid of them, and the lichen flora is altogether poor as to the number of species. The Caliciæ are represented by but three species, and the whole group of the Sclerolichens only by five or six species, none of them being spread over the whole of the coast. The Stictaceæ are represented by a couple of species of *Nephroma*; the Pannariaceæ by five to six species; *Pyrenopsis* has but one species which is widely spread, but not very common. The character of the flora is nearly the same on the whole of the coast, but towards the south, where the country becomes inhabited, the flora undergoes a notable change. The Phanerogams become also comparatively rich towards the east, in the land of the Chukches, where the grasses appear in the shape of whole sods, without a mixture of moss. The Algæ are few in the Siberian Sea, the whole number of observed species being but twelve, that is, only one-half of the number of species that are known on the Murman coast and in the Sea of Spitzbergen. The characteristic feature of all Arctic Algæ being their large size, the Siberian Algæ seem to be an exception to this rule. The largest of them was a *Laminaria Aghardii*, 210 centimetres long and 37 cm. wide.

The papers by MM. Kjellman and Lundström on the Phanerogams of the explored region will be read with great interest both by the botanist and the geographer. They are not bare enumerations of plants, but elaborate sketches of botanical geography taking into account former botanical work in neighbouring tracts, and describing the flora in its dependence upon local conditions of climate and soil. The coast-flora of Northern Siberia is altogether poor, as it numbers but 150 species of Phanerogams; this number slightly increases, however, towards the east, where it reaches 221, as well as towards the west, 185 species being known from Novaya Zemlya. The Obi—at least as far as the coast region proper is concerned—is not a separation-line between the Arctic European and the Arctic Asiatic floras, as was expected by Hooker. Only the *Salix rotundifolia* and *Wahlbergella affinis* do not appear to the east of the great West Siberian river. Of the 150 species noticed, only one-third are Monocotyledons. This proportion increases, however, at certain places, and there are monocotyledonous species extending over large areas. However poor as to the number of species, the Siberian coast-flora still affords a variety of forms, as it has representatives of 33 different families and 93 different genera. The families which are the most represented in the coast-flora are those of Gramineæ and Cruciferae, which number respectively 23 and 20 species. They are followed by those of the Compositæ, Saxifragaceæ, Ranunculaceæ, Cyperaceæ, and Caryophyllaceæ (15 to 11 species). The family of Saxifragaceæ is that which maintains the greatest number of species towards the north, eight species out of fourteen having been found even at Cape Chelyuskin; the Caryophyllaceæ nearly keep pace with the former; whilst the family which spreads least towards the north is that of Compositæ.

which was represented only by two species at the mouth of the Taimyr and none at Cape Chelyuskin. So also with the Cyperaceæ and Ranunculaceæ. *Saxifraga oppositifolia* is not the most widely-spread species on the Siberian northern coast, as is the case for other parts of the Arctic region, other species of Saxifraga being as much or more extensively spread than it. The most usual phanerogamous plants on the coast seem to be the *Luzula arcuata*, var. *hyperborea*, and *Stellaria longipes*.

We shall not analyse the valuable paper by M. Kjellman on the flora of Novaya Zemlya, which is a summary of all that is known on this subject, and we shall notice but a few facts concerning the vegetation of the Siberian coast of Bering Strait. It is represented on M. Kjellman's lists by 221 species belonging to 41 families and 109 genera. The Compositæ, Cyperaceæ, Saxifragaceæ, Caryophyllaceæ, and Gramineæ, numbering from 20 to 15 species each, are here also the richest as to the number of species. But we find on the Asiatic coast of the Bering Strait a good many plants belonging to the American flora, as also to the flora of the Altai and Baikal regions, which are not met with elsewhere on the northern coast. No less than 53 species out of 221 appear only to the east of the Kolyma, which appears thus to be, for the coast-region, a more important boundary line than the Obi. This notable increase cannot be accounted for only by the milder character of this region, but it could be explained, in our opinion, if we took notice of the orography of Eastern Siberia, which favours, by the extension of its chains of mountains from south-west to north-east, the spread of both animals and plants in the same direction.

Dredging was very diligently carried on during the whole of the cruise of the *Vega* in the Arctic Ocean; and Mr. Stuxberg's map of dredgings made during the Swedish expeditions of 1875, 1876, and 1878 to 1879, is dotted with 33 spots in the Kara Sea, and with 90 spots along the Siberian coast to Bering Strait. The temperature of water obviously was found to be very low; even at a few fathoms below the surface it was from -0.9° to -2.3° at a depth of 50 metres, and it had a normal specific gravity of 1.027. The most uniformly spread animals in the Siberian coast-region of the Arctic Ocean, and in the Kara Sea, are undoubtedly the Crustaceans; the Echinoderms are comparatively few, as also are the Mollusca, Bryozoa, and Hydroids. The Crustaceans *Idothea Sabinei*, *Idothea entomon*, *Diastylis Rathkei*, *Atylus carinatus*, and *Acanthostephia Malmgreni*, are the most usual. The first, as known, has been found nearly everywhere in the Arctic Ocean; whilst the second proved to be specific for the whole of the Arctic coast of the old continent, for a stretch of nearly 160 degrees of longitude; it has been found also in the lakes of Sweden and Northern Russia, even in the Caspian and Lake Aral—Lake Baikal being till now the sole explored great lake of this part of the old continent where it has not yet been found. As to the vertical distribution of the animal forms, no distinct regions can be established. It must be observed, however, that the littoral region—about 30 fathoms deep—on account of its ice and sweet water brought by rivers, is nearly quite devoid of animals; even the littoral forms go to take refuge in the sublittoral region. Not only is the Siberian Sea very rich in forms of animals (the number of described Amphipods being as much as 59 out of 114 Amphipods known in all Arctic seas together); it contains also such a number of individuals of certain species, that Mr. Stuxberg describes about 20 real "formations" (*djurformationen*), each consisting of very large quantities of individuals of one given species, with a comparatively small mixture of other species. Such are the *Diastylis Rathkei*, *Reticulipora intricaria*, *Alcyonidium mammillatum*, *Chiridota laevis*, *Echinus drobachiensis*, *Asterias Lincki*, *Archaster tenuispinus*, *Ctenodiscus crispatus*,

Ophiacantha bidentata, *Ophiocten sericeum*, *Ophioglyphia nodosa*, *Astrophyton eucnemis*, *Antedon Eschrichti*, *Yoldia arctica*, and *Idothea entomon*, as also Ascidiae, Actiniae, and Hydroids. As a whole, the Siberian basin differs very much in its fauna from the other parts of the Arctic basin, and it has no less than 16 species that are characteristic of it. Novaya Zemlya is the limit of the fauna of the Siberian Sea, being a separation-line for many species.

The foregoing notice will give a general idea of the valuable material contained in the first volume of the "*Vega's* Scientific Work," and the manner it is treated. We have but to express the wish to see, as soon as possible, the appearance of the following volumes of this series. They will surely give a new and powerful impulse to the study of Northern Siberia. P. K.

NOTES

WE are glad to learn that Mr. Spottiswoode continues to go on favourably.

STILL another well-deserved honour for Sir Joseph Hooker. The Society of Arts' Albert Medal for "distinguished merit for promoting arts, manufactures, or commerce," has been awarded to him for the present year, for the eminent services which, as a botanist and scientific traveller, and as Director of the National Botanic Department, he has rendered to the arts, manufactures, and commerce by promoting an accurate knowledge of the flora and economic vegetable products of the several colonies and dependencies of the Empire.

AMONG those to whom the Council of the Society of Arts have awarded their silver medals are Mr. Alex. Siemens and Dr. Hopkinson, for their papers on "The Transmission of Power by Electricity," and "The Portrush Railway," and to Capt. Douglas Galton for his paper on "The Economy of Sanitation." Thanks were voted to Mr. W. H. Preece, F.R.S., for his paper on Electrical Exhibitions.

A SPECIAL extra meeting of the Anthropological Institute was held at the Piccadilly Hall on Tuesday, when the Botocudo Indians and a large ethnological collection from Brazil were exhibited by the kindness of Mr. C. Ribeiro, and Prof. A. H. Keane read a paper descriptive of the Botocudos.

MR. MARK H. JUDGE has resigned his position as Secretary and Curator of the Parkes Museum.

M. DE LESSEPS has declared officially at the Academy of Sciences the intention of the Suez Company to open a new canal. During the works the maritime way will be lighted by electricity, and an appeal has been addressed to physicists to present their several systems. The work will begin as soon as possible.

WE have received a favourable report of the National Museum, Bloemfontein, Orange Free State. Considerable collections are being brought together, but the committee should not forget that the chief object of such a museum ought to be to make its collections mainly representative of the interesting country in which it is placed.

DR. KERR of Canton is publishing in Chinese a complete work on the theory and practice of medicine, compiled from European standard works upon that subject. The sections on fevers, and diseases of the stomach, have already been published, while those on affections of the heart and lungs have just been issued. Volumes on the kidneys and nervous system are in the press. The translator has omitted the discussion of all unsettled theories and disputed points. The volumes are printed from wooden blocks, clearly and evenly cut, and are sold at a price which brings them within the reach of all.